Light Sheet for the Dynamic Detection of Three-dimensional Objects

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Technology description

New Light Sheet Microscopy Method Allows for the Dynamic Investigation of Macroscopic to Subcellular Processes
Microscopic examinations are widely applied in biomedical research. When imaging living cells and organisms, however, a central challenge consists in analyzing the complete extent and dynamics of growth processes and in reaching a high spatial and temporal resolution. By means of the so-called light sheet microscopy, biological objects can be studied in three dimensions. For microscopy, a sample is moved through a light sheet and the fluorescent light is recorded by a camera. In conventional light sheet microscopy, the sample to be studied is positioned in a cylinder filled with a gel. This results in a number of drawbacks. Due to rigid positioning, growth of the object is inhibited. However, it is this growth that often is in the center of microscopic analysis. Rapid exchange of the objective requires a high expenditure or is impossible. Components of the sample holder change the optical properties and reduce image quality. Recordings of several objects in series over a certain period of time are impossible.
Scientists of the Institute of Toxicology and Genetics (ITG) and the Institute of Applied Physics (APH) solved these problems by avoiding the conventional arrangement of illumination and detection objectives.

Application area

The light sheet fluorescence microscope may be applied in the fields of developmental and cellular biology and toxicology. It may also be combined with conventional inverse light microscopes.

Advantages

Spatial restrictions in the positioning of objects do no longer exist.
The sample to be studied does not have to be fixed into a cylinder any longer.
Orientation takes place freely on the object table, which is a big advantage in the development and growth phase of the object. Due to simultaneous illumination and detection by several identical

objectives, the light yield and recording speed are increased.
High-resolution images of more than 5 megapixels are obtained. Exchange of the objective is simple and quick.

Institution

Karlsruhe Institute of Technology